Managing the Watercourse

7. Install turbidity curtain when water surface velocity and depth are sufficient to move debris downstream outside of work area in sensitive water bodies (See Section 5.2).

8. At the end of each workday, remove any debris or sediment deposited outside of the work area as a result of the bridge construction.

Figure 21 – Bridge Construction within Wetlands

Managing the Work Area

9. Evaluate proposed bridge structure and site for best construction methods that will minimize erosion potential and construction debris. Steps for sequencing are required on work plan.

10. Store construction material and equipment within the construction limits of the project and away from flood prone areas. No equipment should be stored in wetlands, surface waters, or protected riparian buffers.

11. Transfer of fuel and vehicle maintenance should occur in a fuel containment area which is at least 50 feet away from any surface water.

12. Locate all equipment on existing roadways or specially constructed work pads.

13. Inspect and repair equipment for possible leakage of liquid or semi-liquid fuels and lubricants. Promptly remove any leaking equipment from the area.

14. Contain fresh concrete in wood or plastic forms and properly clean-out areas so that no seepage occurs into the adjacent water body, especially with the pouring of foundation work.

    - ***No live or fresh concrete shall come into contact with jurisdictional waters until the concrete has cured.***

15. Install any scour protection measures in accordance with permit conditions.

Ground Stabilization

16. Maintain and adjust erosion and sedimentation control measures as needed during all construction phases of the project

Figure 22. Completed Bridge Construction

Site Cleanup

17. Remove inactive equipment from temporary causeway or floodplain areas.

18. Dispose of construction debris and stockpiles of erodible material properly and stabilize the site with sufficient ground cover that will restrain erosion.

4.8 CHANNEL RELOCATION

This section describes the steps to take when an existing stream or channel is being relocated.

Erosion Control

1. Prior to installing Erosion Control, identify permit conditions and impact area limits. Contact the Division Environmental Officer (DEO) for information on permit drawings or jurisdictional areas.

2. Install temporary silt fence, silt ditch, temporary rock silt check type “A”, or temporary sediment dam type “B” to treat runoff from the work area (See Section 5.1).

3. Typical channel relocation projects require erosion control measures to be added and removed throughout construction to prevent sediment and debris from reaching the active stream.

Figure 23. Stream Channel Relocation

Managing the Watercourse

4. The existing stream shall be maintained as much as practical while the relocated channel section is constructed

5. Typically flow diversion is utilized to isolate the work area using a fabric-lined diversion channel (See Section 5.2) when the existing stream cannot be maintained.

    - **The existing stream shall not be diverted during fish migration periods.**

6. The existing stream flow shall only be diverted into either a stable temporary flow diversion channel or a completed and stabilized relocated channel reach.

Managing the Work Area

7. Channel relocation projects typically include inactive and active work areas to minimize the amount of exposed soil at any given time.

8. Inactive work areas shall be stabilized by seed and mulch temporarily, such that the work performed will not be displaced in the event the area is inundated during a storm event. (See Section 5.6).

9. Active areas shall be temporarily stabilized prior to an anticipated precipitation event to prevent the work performed from being displaced in the event the active work area is inundated.

Figure 24. Completed Stream Channel Relocation

10. Riprap shall only be placed when specifically shown on the plans.

    - ***Riprap shall consist of clean rock or masonry material free of debris or pollutants.***
    - ***No material shall be placed which impairs surface water flow into any wetland area.***
    - ***No material shall be placed in a manner that will be eroded by normal or expected high flows.***

11. The stream dimensions and depth shown on the plans are critical to the proper function of the channel relocation. Notify the Resident Engineer and/or regulatory agencies immediately if these dimensions cannot be maintained.

Ground Stabilization

12. The relocated channel and surrounding area shall be properly stabilized prior to receiving the normal stream flow. It is important that vegetative plantings occurs at the proper time of the year and as soon as possible to help stabilize the stream.

Site Cleanup

13. Remove the flow diversion, if necessary, and allow the stream to flow through the new channel.

    - ***The impervious dike shall be completely removed from the existing stream and the affected areas restored to the pre-project conditions***

14. Remove all temporary erosion control measures and properly dispose of excess spoil in upland disposal area which require field confirmation/verification by DEO.

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5.0 OPERATION BEST MANAGEMENT PRACTICES

Best Management Practices, or BMPs, include the host of tools that are applied to a project to prevent pollutants from entering jurisdictional waters and to minimize any pollutant loading. These tools include structural and non-structural measures. In some cases, a BMP is a structure that is installed on the site and in other cases it is the way in which a project is managed or, more typically, a combination of both. BMPs in this manual are targeted at reducing the impact to jurisdictional waters by roadway construction and/or maintenance activities. It is assumed that the proper permits have been obtained and notifications sent before any work begins in the jurisdictional areas.

5.1 EROSION CONTROL

Erosion control consists of measures taken to prevent sediment from leaving the job site. These controls intercept and settle sediment from runoff before it is discharged from the project. Erosion controls also help reduce velocity and reduce the erosive force of runoff. All erosion and sedimentation devices should be placed outside of wetlands, streams, and buffer areas.

5.1.1 Temporary Silt Fence

5.1.2 Special Sediment Control Fence

5.1.3 Temporary Silt Ditch

5.1.4 Temporary Rock Silt Check Type "A"

5.1.5 Temporary Rock Sediment Dam Type "B"

5.1.1 Temporary Silt Fence

Purpose

A temporary sediment device consisting of geotextile fabric installed between supporting posts. The silt fence intercepts water flow from the site, decreases velocity, and causes suspended particles to settle.

Figure 25. Silt Fence

Conditions Where Practice Applies:

- ✓ Below small disturbed areas less than ¼ acre per 100 feet of fence.
- ✓ Where runoff can accumulate behind the sediment fence without damaging the fence or the inundated area behind the fence.

Conditions Where Practice Does Not Apply:

- ✓ Do not install sediment fences across streams, ditches, waterways or areas that have concentrated flow.

Construction

- Reference Std. 1605.01 – Erosion and Sedimentation Control Field Guide.
- Reference Section 1605 – Standard Specifications for Roads and Structures, Current Edition
- Reference Std. 1605.01 – Roadway Standard Drawings, Current Edition

Maintenance

- Inspect silt fences on a regular basis and after each rainfall. Make any required repairs immediately.
- Inspect silt fence to be sure bottom edge is keyed in properly.
- Remove and replace deteriorated or clogged silt fence.
- Remove and dispose of sediment accumulations when depth reaches one-half the height of the filter fabric. Take care to avoid undermining the fence during cleanout.
- Replace silt fence removed for access at the end of each day's operation.
- Install additional posts or wire backing if fence is sagging.

Typical Problems

- Improper installation (bottom of fabric not buried or keyed-in properly.
- Failure due to installation across streams, ditches, waterways, and other areas that receive concentrated flow.
- Excessive sediment accumulations.
- Knocked down or cut by fallen trees, equipment, excess water flows, or for work access.
- Inadequate access to maintain and remove fence.
- Installed across contours creating channelized flow behind fence.

5.1.2 Special Sediment Control Fence

Purpose

A special sediment control fence is a hardware cloth with sediment control stone at the base and contained by wire mesh fence. Water from the site drains through the sediment control stone causing sediment to be trapped or settle.

Figure 26 – Typical Special Sediment Control Fence

Conditions Where Practice Applies:

Where the volume of water is too extensive for a silt fence
Where inadequate right of way is available for a silt ditch

Conditions Where Practice Does Not Apply

Where topography forces water to run along the base of the sediment control stone instead of allowing the water to pond up and flow through the stone.

Construction

- Reference Std. 1606.01 – Erosion and Sediment Control Field Guide.

Maintenance

- Inspect sediment control fence on a regular basis and after each rainfall. Make any required repairs immediately.
- Remove and replace clogged sediment stone.
- Install additional posts or wire if fence is sagging.

5.1.3 Temporary Silt Ditch

Purpose

Used in place of Silt Fence where room allows. Use in conjunction with Rock Sediment Dams or other measures to contain sediment at the outlet.

Figure 27. Temporary Silt Ditch

Conditions Where Practice Applies

- ✓ Toe of fill slopes where fill exceeds 3 feet (1 meter) in vertical height.
- ✓ Adjacent streams to intercept flow and/or divert to a controlled outlet.
- ✓ Along project perimeters to minimize sediment loss from the site.

Conditions Where Practice Does Not Apply

- ✓ Within jurisdictional waters and wetlands.
- ✓ When access is difficult due to high fill slope.

Construction

- Reference Std. 1630.03 – Erosion and Sediment Control Field Guide.
- Reference Std. 1630.03 – Roadway Standard Drawings, current edition.

Maintenance

- Clean out sediment when silt ditch is one half full.
- Rebuild ditch daily when damaged by equipment or covered by fill.
- Inspect erosion control devices at outlet. Remove sediment and repair any damage.

Typical Problems

- Excessive sediment accumulations.
- Outlet protection not maintained.
- Requires room for stockpiling sediment cleanout material or material must be hauled off from the site.

5.1.4 Temporary Rock Silt Check Type "A"

Purpose

A small dam with a weir outlet that uses a naturally-formed storage area to trap sediment (rather than an excavated pit). These are generally referred to as check dams.

Figure 28. Rock Silt Check Type "A"

Conditions Where Practice Applies:

- ✓ In channels, roadside ditch outlets, temporary silt ditches, and temporary diversions.
- ✓ In conjunction with Type-B silt basins.
- ✓ In channels where sandy soil prohibits the use of Type-B silt basins.
- ✓ In jurisdictional wetlands without any excavation, Type B silt basins, and any silt deposits must be removed upon completion.

Conditions Where Practice Does Not Apply:

- ✓ These check dams may not be placed in live streams

Construction

- Reference Std. 1633.01 – Erosion and Sediment Control Field Guide.
- Reference Section 1633 – Standard Specifications for Roads and Structures, Current Edition
- Reference Std. 1633.01 – Roadway Standard Drawings, Current Edition

Maintenance

- Inspect after each significant rainfall.
- Remove sediment from device when sediment accumulates.
- Rebuild and reshape structure and weir when damaged.
- Clean out when clogged by straw, limbs, or other debris.

Typical Problems

- Rock structure is not rebuilt when damaged by storms, equipment, etc.
- Rock weir sections are not constructed properly.
- When weir is constructed higher than outside edges, water may flow around dam and erode ditch.
- Not built wide enough to intercept ditch slope at top of check dam.

5.1.5 Temporary Rock Sediment Dam Type "B"

Purpose

A small Class B stone dam with sediment control stone and built in sediment basin. Typically, used at the outlets of roadside ditches or channels to impound and settle runoff prior to entering streams or exiting site.

Figure 29. Temporary Rock Sediment Dam Type "B"

Conditions Where Practice Applies:

- ✓ At outlets of temporary diversions, temporary silt ditches, channels, and temporary slope drains.
- ✓ In locations where dam can be cleaned and maintained on a regular basis.
- ✓ In locations where runoff is exiting the construction site.
- ✓ In small natural drainage turnouts.

Conditions Where Practice Does Not Apply:

- ✓ Use may be limited in buffer zones

Construction

- Reference Std. 1634.02 – Erosion and Sediment Control Field Guide.
- Reference Std. 1634.02 – Roadway Standard Drawings, Current Edition
- Reference Section 1634 – Standard Specifications for Roads and Structures, Current Edition.

Maintenance

- Inspect after each significant rainfall.

- Remove sediment from device when sediment accumulates to one-half the basin area formed by the dam.
- Remove and replace sediment control stone when water no longer drains between rainfall events.
- Rebuild and reshape structure and weir when damaged.
- Clean out when clogged by straw, limbs, or other debris.

Typical Problems

- Sediment accumulations are not removed when needed.
- Structure not rebuilt when damaged.
- Rock weirs are not constructed properly.
- Stone is not cleaned or replaced when clogged.
- Stone is not tied into slopes.
- Fabric not placed under stone for reinforcement

5.2 FLOW DIVERSION

The normal flow of a stream must be diverted and the work area isolated to allow a project to proceed. The watercourse should be managed to minimize adverse impacts to the jurisdictional waters. All projects should be planned to minimize the time that the watercourse will be diverted.

Several methods of diverting a watercourse are provided in this section. There may be certain seasonal components to consider when attempting flow diversion of a stream, such as spawning times of individual fish species.

5.2.1 Bypass Pumping

5.2.2 Suspended Bypass Pipe

5.2.3 Piped Diversion

5.2.4 Fabric Lined Diversion Channel

5.2.1 Bypass Pumping

Purpose

A bypass pump and an impervious dike divert the flow of the watercourse from the inlet of the pipe to the outlet of the pipe. This is a water-to-water operation and care should be taken that the discharge is at a low flow rate to minimize turbidity at the outlet of the bypass pipe and/or eroding the channel.

Figure 30. Bypass Pumping

Conditions Where Practice Applies

- ✓ When another type of diversion is not physically possible or practical.
- ✓ When the repair or construction activities will not require pumping for an extended period of time.

Conditions Where Practice Does Not Apply

- ✓ When the discharge location can not be adequately stabilized
- ✓ When ponding of the stream to adequately submerge the pump suction line is not allowed or not practical.
- ✓ When the normal flow of the stream cannot be handled by the typical bypass pump.

Construction

Step 1 – Set up bypass pump and temporary piping. Place outlet of temporary pipe to minimize erosion at discharge site or provide temporary energy dissipation measures. Firmly anchor pump and piping.

Step 2 – Construct outlet protection if needed.

Step 3 – Construct impervious dike upstream of work area to impound water for bypass pump intake. Use a floating intake for

pumps where possible.

Step 4 – Construct an impervious dike downstream, if necessary, to isolate work area.

Step 5 – Check operation of pump and piping system Step 4 -

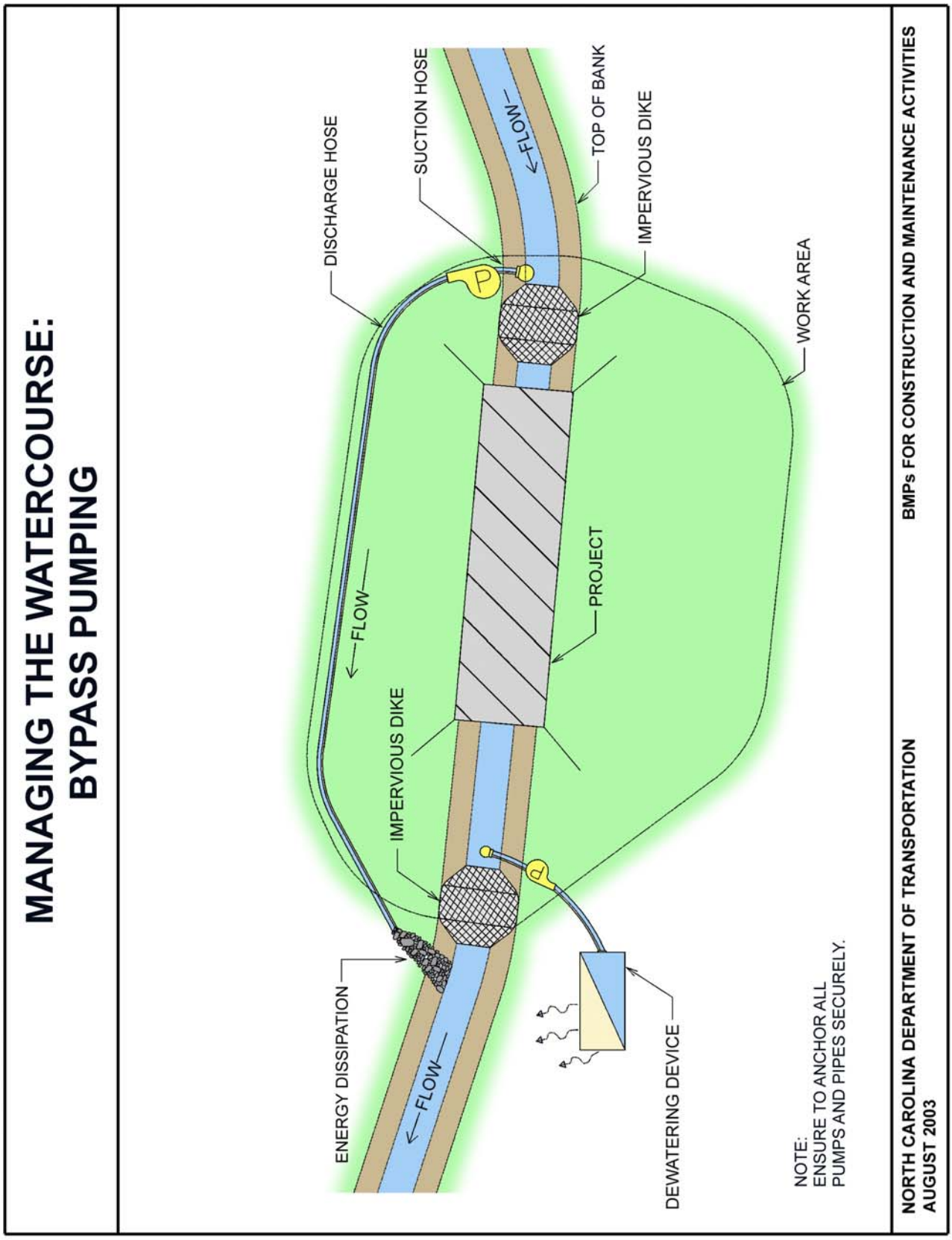
Step 6 – Upon completion of construction, remove impervious dike, bypass pump, and temporary pipe.

Maintenance

- Routinely inspect bypass pump and temporary piping to ensure proper operation.
- Inspect impervious dike for leaks and repair any damage.
- Inspect discharge point for erosion.
- Ensure flow is adequately diverted through pipe.

Typical Problems

- Pump failure.
- Erosion at outlet.
- Leaks in piping and improper connection to pump.


MANAGING THE WATERCOURSE:
BYPASS PUMPING
DISCHARGE HOSE
SUCTION HOSE
FLOW
TOP OF BANK
IMPERVIOUS DIKE
WORK AREA
PROJECT
FLOW
IMPERVIOUS DIKE
ENERGY DISSIPATION
FLOW
DEWATERING DEVICE
NOTE:
ENSURE TO ANCHOR ALL
PUMPS AND PIPES SECURELY.
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
AUGUST 2003
BMPs FOR CONSTRUCTION AND MAINTENANCE ACTIVITIES

5.2.2 Suspended Bypass Pipe

Purpose

The suspended bypass pipe is used where an existing pipe or culvert is extended. This bypass pipe is constructed inside the existing pipe or culvert to divert the watercourse through the work area while allowing the work area to remain dry.

Figure 31 Suspended Bypass Pipe

Conditions Where Practice Applies

- ✓ When a pipe or culvert is being extended and is large enough to accommodate the bypass pipe.
- ✓ When space limitations do not allow for a fabric lined diversion channel

Conditions Where Practice Does Not Apply

- ✓ When the upstream ponding required to enter the suspended pipe inlet is unacceptable.

Construction

Step 1 – Install sediment controls.

Step 2 – Install temporary pipe through the existing pipe or culvert to be extended. Place outlet of temporary pipe to minimize erosion at discharge site or provide temporary energy dissipation measures.

Step 3 – Construct an impervious dike upstream of the work area to divert flow through the temporary pipe. Anchor and seal temporary pipe securely at inlet.

Step 4 – Construct an impervious dike at the downstream side of the bypass pipe to isolate work area.

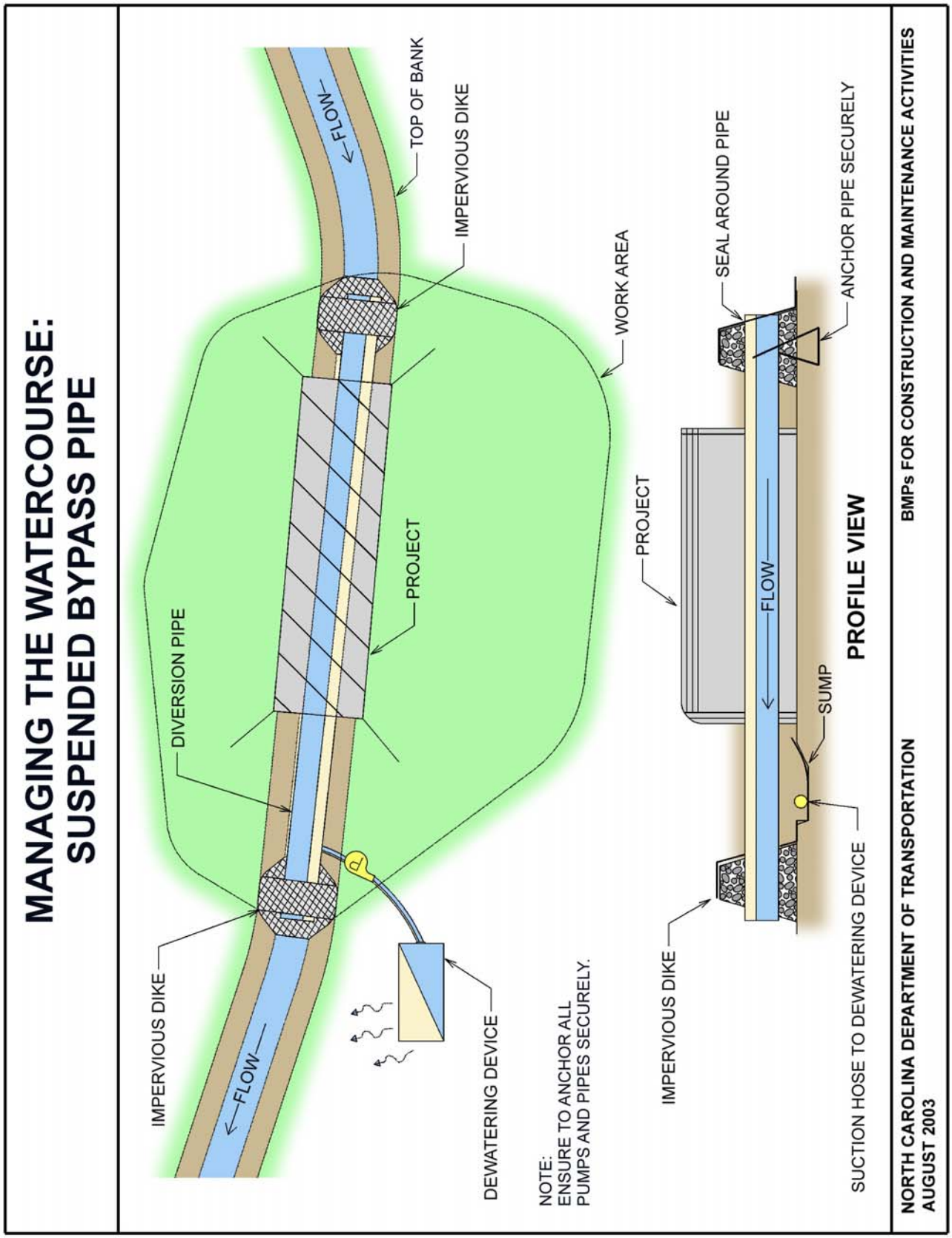
Step 5 – Upon completion of the culvert or pipe extension, remove the impervious dike and temporary pipe.

Maintenance

- Inspect the inlet regularly and dike for damage and/or leakage and to ensure flow is adequately diverted.
- Remove sediment and trash that accumulate behind the dike and at the inlet on a regular basis.
- Inspect the outlet regularly for erosion and to ensure flow is adequately diverted through the system.

Typical Problems

- Failure because inlet is not properly anchored and sealed.
- Erosion at outlet.
- Inlet clogged with debris.


MANAGING THE WATERCOURSE:
SUSPENDED BYPASS PIPE
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DEWATERING DEVICE
NOTE:
ENSURE TO ANCHOR ALL
PUMPS AND PIPES SECURELY.
PROJECT
SEAL AROUND PIPE
ANCHOR PIPE SECURELY
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IMPERVIOUS DIKE
SUCTION HOSE TO DEWATERING DEVICE
PROFILE VIEW
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5.2.3 Piped Diversion

Purpose

Install a temporary pipe to divert the flow of the watercourse around the work area without the use of pumping operations. While the cost is higher for this operation, the probability of offsite sediment loss is much lower than with an open diversion channel.

Conditions Where Practice Applies

- ✓ Where adequate slope and space exist between the upstream and downstream ends of the diversion.

Conditions Where Practice Does Not Apply

- ✓ Pipe extensions, headwall installations and some pipe/culvert replacements where adequate space is unavailable.
- ✓ When the pipe would adversely impact the aquatic habitat migration.

Construction

Step 1 – Install sediment controls.

Step 2 – Install temporary pipe adjacent to work area. Excavation may be required to provide a positive drainage slope from the upstream to downstream side.

Step 3 – Connect the downstream temporary pipe into the downstream existing channel. Place outlet of pipe to minimize erosion at the discharge site or provide temporary energy dissipation measures.

Step 4 – Connect the upstream temporary pipe into the upstream existing channel.

Step 5 – Construct an impervious dike at the upstream side of the existing channel to divert the existing channel into the temporary pipe.

Step 6 – Construct an impervious dike at the downstream side of the bypass pipe to isolate work area.

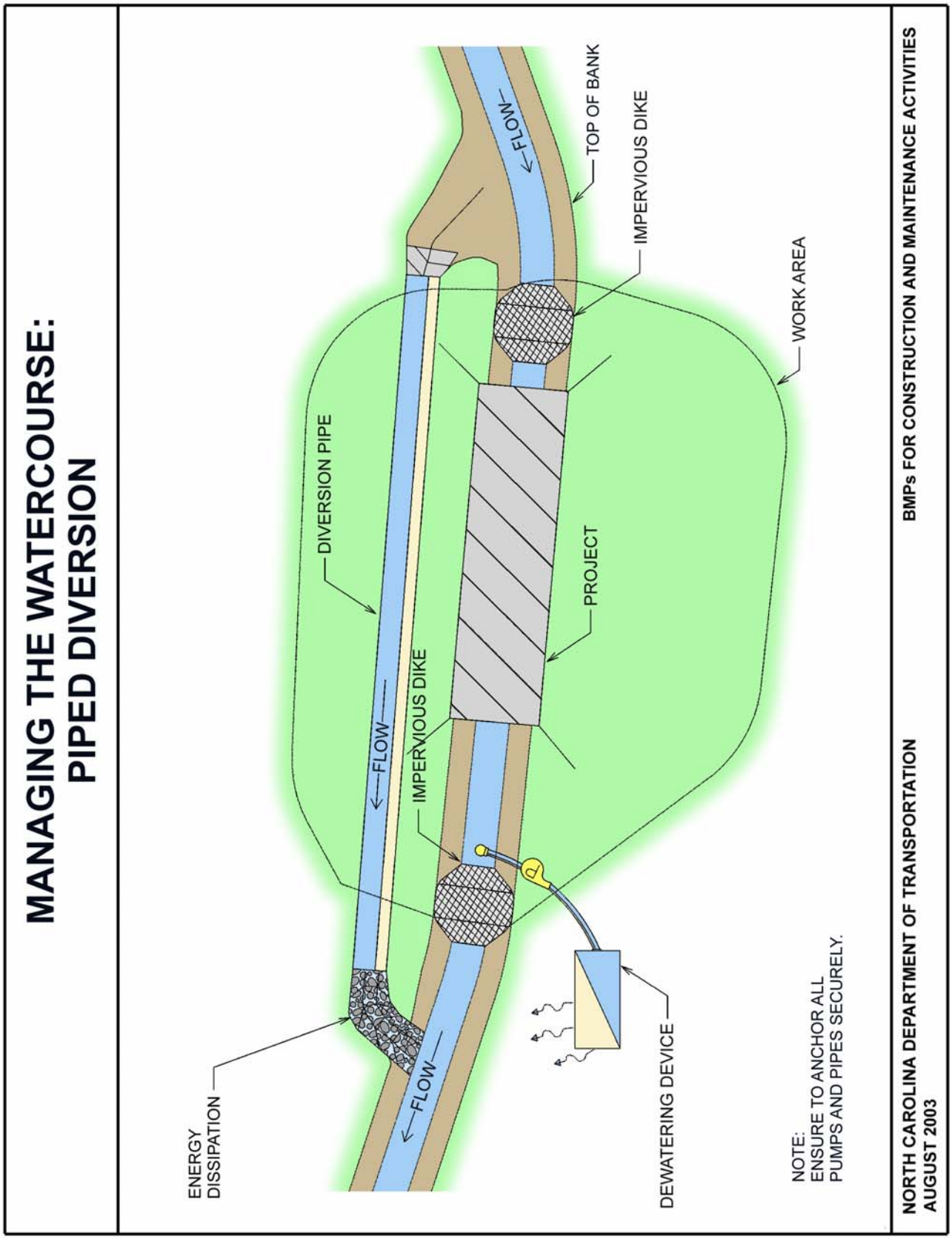
Step 7 – Upon completion of construction, remove the impervious*.*

Maintenance

- Inspect diversion berm and piping for damage.
- Remove accumulated sediment and debris from berm and inlet.
- Inspect outlet for erosion.

Typical Problems

- Improper amount of slope that impedes diverted flow.
- Diverted flow bypasses the temporary pipe and causes erosion as surface flow.


MANAGING THE WATERCOURSE:
PIPED DIVERSION
TOP OF BANK
IMPERVIOUS DIKE
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WORK AREA
DIVERSION PIPE
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5.2.4 Fabric Lined Diversion Channel

Purpose

Used to divert the normal flow and small storm events around the work area without the use of pumping operations. The diversion channel is typically constructed adjacent to the work area and is lined with a poly-fabric to prevent erosion of the diversion channel.

Figure 32. Fabric Lined Diversion Channel

Conditions Where Practice Applies

- ✓ When adequate space and slopes exist adjacent to the work area.

Conditions Where Practice Does Not Apply

- ✓ Pipe extensions, headwall installations and some pipe/culvert replacements where adequate space is unavailable.

Construction

Step 1 – Install sediment controls.

Step 2 – Excavate the diversion channel without disturbing the existing channel.

Step 3 –Place poly-fabric liner in diversion channel with a minimum of 4 feet of material overlapping the channel banks. Secure the overlapped material using at least 1 foot of fill material.

Step 4 – Connect the downstream diversion channel into the downstream existing channel and secure the poly-fabric liner at the connection.

Step 5 – Connect the upstream diversion channel into the upstream existing channel and secure the poly fabric liner at the connection.

Step 6 – Construct an impervious dike in the existing channel at the upstream side to divert the flow into the diversion channel.

Step 7 – Construct an impervious dike in the existing channel at the downstream side to isolate the work area.

Step 8 – Upon completion of the culvert construction, remove the impervious dikes and divert the channel back into the culvert.

Step 9 – Remove the poly-fabric liner and fill in the diversion channel.

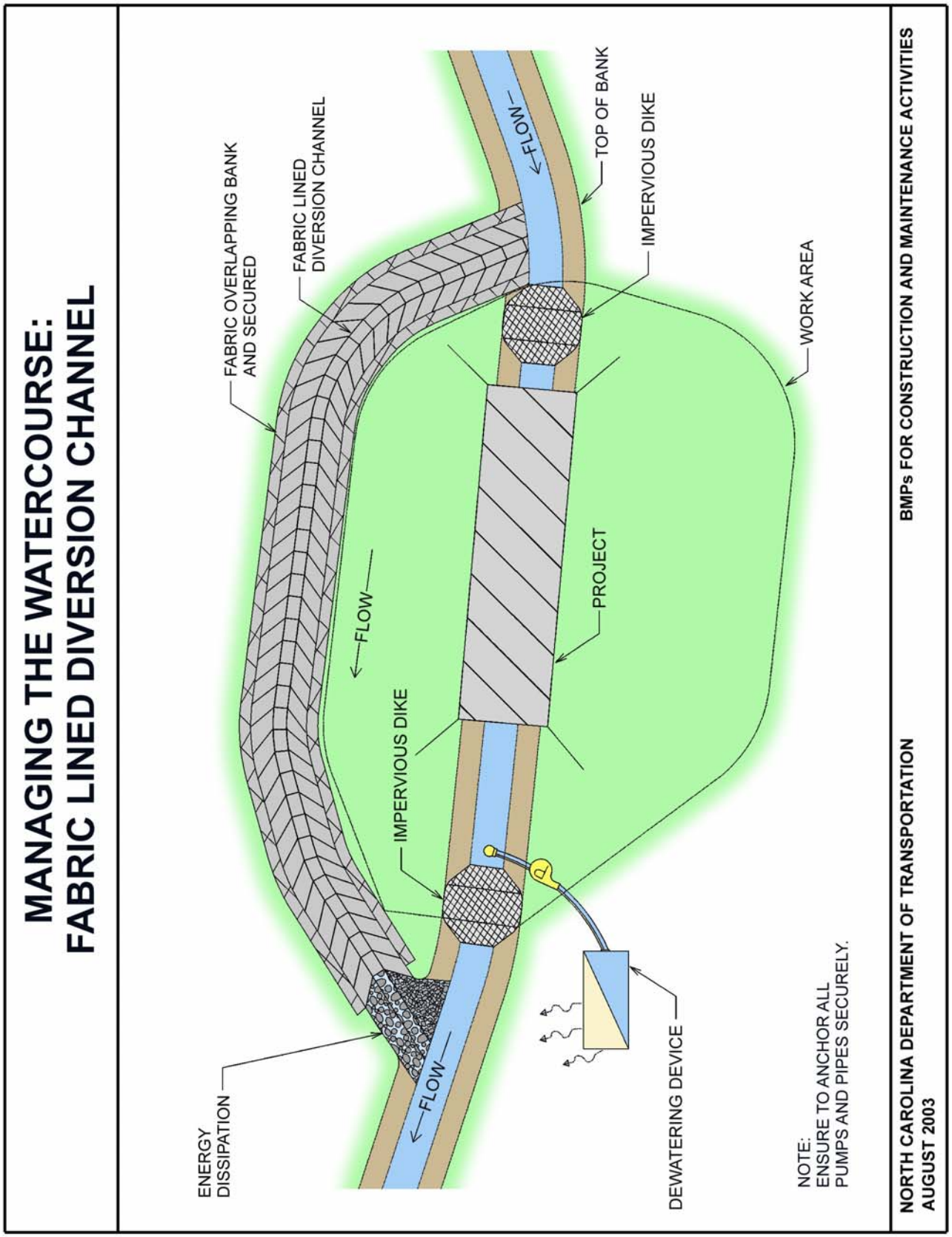
Step 10 – Establish vegetation on fill section and all other bare areas.

Maintenance

- Check the poly-fabric liner for stability during normal flow
- Check the liner for stability after each rainfall event

Typical Problems

- Improperly installed liners.
- Filter fabric not installed (secured) properly.
- Earthen material allowed to come into contact with water body.
- There maybe certain times of the year, especially in the summer, when fabric-lined channels may cause thermal pollution. This could be a problem in trout waters during certain times of the year.


MANAGING THE WATERCOURSE:
FABRIC LINED DIVERSION CHANNEL
FABRIC OVERLAPPING BANK AND SECURED
FABRIC LINED DIVERSION CHANNEL
FLOW
TOP OF BANK
IMPERVIOUS DIKE
WORK AREA
PROJECT
FLOW
IMPERVIOUS DIKE
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NOTE:
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5.2.5 Turbidity Curtain

Purpose

Used as instream erosion control filtration device to isolate the streambank work from the normal flow of the stream. This device is normally used in open waters for containment in work zones. May also be used across channels with very low flow for short-term work when anchored properly.

Figure 33. Turbidity Curtain

Conditions Where Practice Applies

- ✓ When performing work on a stream bank in a small localized area.
- ✓ When the repair or construction activities will not require an extended period of time to complete.

Conditions Where Practice Does Not Apply

- ✓ Across flowing streams. Turbidity curtains are not designed as prefabricated dams.

Construction

The curtain should be made of a tightly woven nylon, plastic or other non-deteriorating material. The material shall meet the following specifications:

Property	Value
Grab tensile strength	*md-370 lbs. (1.65 Kn) *cd-250 lbs. (1.11 Kn)
Mullen burst strength	480 psi (3307 kpa)
Trapezoid tear strength	*md-100 lbs. (0.45 Kn) *cd-60 lbs. (0.27 Kn)
Apparent opening size	70 us standard sieve (0.210 mm)
Percent open area	4% permittivity 0.28 sec-1

*md – machine direction
*cd – cross machine direction

- A flotation material with over 29 lbs./ft. (43 kg/m) buoyancy shall support the curtain material. A 5/16 inch (7.8 mm) galvanized chain shall act as ballast for the floating curtain. Dual 5/16 inch (7.8 mm) galvanized wire ropes with a heavy vinyl coating shall be used as the load lines.

Maintenance

- Inspect the curtain, flotation and ballast to ensure the work area is securely partitioned from the stream flow.
- Remove accumulated sediment and debris.

Typical Problems

- Does not permanently remove sediment.
- Improper anchoring of curtain on channel bottom.
- Tidal flows requiring frequent repositioning

5.3 IMPERVIOUS DIKES

Impervious dikes are used to divert normal stream flow around a construction site. Acceptable materials for impervious dikes include, but are not limited to, sheet piles and sandbags and/or the placement of an acceptable size stone lined with polypropylene or other impervious fabric. Also, prefabricated dams and/or the placement of appropriately sized stone lined with polypropylene or other impervious fabric can be used. Earthen material should not be used to construct an impervious dike when it is in direct contact with the stream unless cover of vegetation can be established before there is contact with the stream.

5.3.1 Stone with Impervious Fabric

5.3.2 Sand Bags

5.3.3 Prefabricated Dams

5.3.4 Sheet Piles

5.3.1 Stone with Impervious Fabric

Purpose

A stone dike encapsulated with a high tensile impervious geotextile fabric material to create a temporary impervious barrier that will either impound or divert water. This barrier can be constructed to the shape of the existing channel.

Figure 34. Installation of Stone with Impervious Fabric

Conditions Where Practice Applies

- ✓ When the size of the pipe is less than 48-inches.
- ✓ When heavy equipment can be used for installation.

Conditions Where Practice Does Not Apply

- ✓ When the pipe is 48-inches or greater

Construction

Step 1 – Prepare the channel and overbanks for installation.

- Remove all branches and debris from location of the stone dike.
- Make sure that there are no sharp rocks or roots that can puncture the fabric.
- Do not excavate the existing channel or banks.

Step 2 – Place the high tensile impervious fabric with the center over the center of the proposed dike. Utilize a small amount of stone to hold down the fabric while adjustments are being made. Ensure there is enough extra fabric on each side of the dike to wrap up and over the stone dike to make it impervious.

Step 3 – Pile stone on top of the fabric to create dike.

Step 4 – Roll fabric up over the stone to form an impervious dike. Make sure the top layer is rolled from the upstream to downstream direction. Secure fabric with metal fence stakes or other suitable material.

Maintenance

- Inspect dike regularly for damage and leakage.
- Remove impounded trash and sediment.

Typical Problems

- Leaks through puncture in fabric.
- Blow-out by large storm events.
- Erosion around the side of dike.

5.3.2 Sand Bags

Purpose

Filter bags filled with sand can be manually stacked to form a temporary impervious dike when encapsulated with an impervious poly-fabric liner. This impervious dike can be used to impound or divert water and can be easily removed.

Figure 35. Sand Bag Installation

Conditions Where Practice Applies

- ✓ Used when low flow rates exist.
- ✓ Used when the height of the dike is less than 15 feet.
- ✓ Used when heavy equipment cannot be utilized.

Conditions Where Practice Does Not Apply

- ✓ Concrete is not allowed in sand mixture.

Construction

Step 1 – Remove branches and large rocks from area where the sand bags will be placed.

Step 2 – Lay out the impervious poly-fabric liner with the center of the liner located over the center of the sand bag dike.

Step 3 – Place the sandbags to the desired height. The dikes shall have a width suitable to support the height. Each row shall be offset so the joints are staggered. Pack sandbags tightly together.

Step 4 – Wrap impervious poly-fabric liner around sandbag dike and secure with final layer of sandbags.

Maintenance

- Periodically inspect sandbag dike for damage and leaks.
- Remove impounded trash and sediment.

Typical Problems

- Leakage due to improper construction or liner failure.
- Blow-out by large storm event.

5.3.3 Prefabricated Dams

Purpose

Prefabricated dams are typically made of an impervious poly-fabric that can be placed in an existing channel. The weight of the water is used to hold the prefabricated dam in place to temporarily impound or divert water.

Figure 36. Prefabricated Dam

Conditions Where Practice Applies

- ✓ When there is a normal flow in the existing channel.
- ✓ When the area of the temporary dam will not puncture the dam.

Conditions Where Practice Does Not Apply

- ✓ Where there is no water to hold the temporary dam in place.

Construction

There are various types and manufacturers of prefabricated temporary dams. The construction guidelines given below are typical. Prefabricated dams shall be installed based on the manufacturers installation guidelines.

Step 1 – Remove the branches, debris, sharp rocks and roots where the prefabricated dam is to be placed.

Step 2 – Place the prefabricated dam in the channel bottom and utilize sandbags or heavy rocks to temporarily anchor to the bottom of the channel.

Step 3 –Secure each end upslope above the toe.

Step 4 – Allow the prefabricated dam to utilize the upstream water pressure to seal the dam and impound or divert the water.

Maintenance

- Monitor prefabricated dam for volume of water flowing, inherent safety, and dam stability.

Typical Problems

- Poor sealing between the prefabricated dam and the bottom of the channel.

5.3.4 Sheet Piles

Purpose

A flat cross-section piling that is driven into the ground and interlocked to create a wall or bulkhead. Sheet piles can be used to detain water in low-flow situations or coupled with bypass pumps to keep a site moderately dry during construction.

Figure 37. Sheet Piles

Conditions Where Practice Applies

- ✓ Where minimum channel disturbance is required.
- ✓ Preferred method of sealing the work area from the watercourse on pipe sizes of 48" and greater.

Conditions Where Practice Does Not Apply

- ✓ Small channel with little or no flow.
- ✓ Where the access to drive piles requires more disturbance to jurisdictional areas than other impervious dikes.
- ✓ Locations where rocks and other obstructions prevent piles from being driven

Construction

- Install by placing and driving piles with a backhoe, excavator, hammer, or other suitable equipment.
- Be sure pile is free of dirt, grease and other potential contaminants before installation.
- Ensure the piles penetrate to a sufficient depth in order to bear the load of water being diverted.
- Overlap or interlock piles in a manner that prevents any

seepage of water into the work area and prevents seepage of sediment from the work area into the stream.

- Remove trapped debris and sediment prior to removing.

Maintenance

- Inspect sheet piles daily for water leaks and signs of instability and implement repair procedures accordingly.

Typical Problems

- Improperly installed piles cause leaks.
- Piles not driven deep enough to withstand pressure of water.

5.4 DEWATERING

Dewatering is the practice of removing water from the work area. This water is considered effluent polluted and must be treated to remove sediment before being discharged into a stream, channel, or other area. Effluent water is typically pumped out of the work area and into one of the erosion control devices identified in this section before being discharged from the site.

5.4.1 Stilling Basin for Pumped Effluent

5.4.2 Special Stilling Basin (Silt Bag)

5.4.1 Stilling Basin for Pumped Effluent

Purpose

Used at sites where dewatering of the work area is required to perform work. The effluent is pumped into the stilling basin to allow the heavier particles to settle out prior to being discharged.

Figure 38. Stilling Basin for Pumped Effluent

Conditions Where Practice Applies

- ✓ Where there is enough room in the work area to form or excavate the basin.
- ✓ Where large volumes of water will be pumped from the work area.

Conditions Where Practice Does Not Apply

- ✓ Not allowed to be constructed in jurisdictional wetlands
- ✓ Should not be built in ditch lines.

Construction

- Reference Std. 1630.04 – Erosion and Sediment Control Field Guide.
- Reference Std. 1630.04 – Erosion and Sedimentation Control Guidelines for Contract Construction.

Maintenance

- Inspect basin after each significant rainfall.
- Basin should be cleaned out when approximately one half full.
- Clean and replace sediment control stone when needed.

Typical Problems

- Inadequate basin capacities – basins are not constructed to dimensions specified on plans.
- Accumulated sediment not removed when needed.

- Basins built in sandy soils may cause sloughing of slopes.
- Erosion occurs at inlet end when basin is too deep.
- Pump discharge entering too close to outlet.

5.4.2 Special Stilling Basin (Silt Bag)

Purpose

Used at sites where the construction limits do not allow for the construction of a stilling basin. The effluent from the work area is pumped into a prefabricated silt bag. Water slowly filters out of the bag in a dispersed manner and the sediment is captured in the bag. Sediment control stone is used as a foundation for the bag.

Figure 39. Silt Bag

Conditions Where Practice Applies

- ✓ When the effluent can be pumped out of the work area at a rate of 1500 gallons per minute or less.
- ✓ When the work area and dewatering volume is small.
- ✓ When there is not enough available non-jurisdictional area to excavate stilling basin.
- ✓ When the repair or construction activities will not require an extended period of time.

Conditions Where Practice Does Not Apply

- ✓ Construction sites that will require large amounts of dewatering.

Construction

- The silt bag shall be at least 10 ft. by 15 ft. The bag should be made from a nonwoven fabric and have a sewn-in sleeve for receiving pump discharge.
- The sediment control stone shall meet the requirements of Section 1005.

- The bag seams should be sewn with a double needle machine using a high strength thread. The seams shall have a wide width strength of at least 60 lb./in. (using test method ASTM D-4884).
- The filter fabric shall meet the requirements of Section 1056 for Type 2 fabric. It shall also meet the following specifications for flow rates, strength, and permeability:

Property	Test Method	Units	Minimum Specifications
Weight	ASTM D-3776	oz/yd	8.0
Grab tensile	ASTM D-4632	lb.	200.0
Puncture	ASTM D-4833	lb.	130.0
Flow rate	ASTM D-4491	gal/min/s.f.	80.0
Permittivity	ASTM D-4991	1/sec	1.5
UV Resistance		ASTM D-4355	%70.0

The silt bag shall be placed on top of at least 6-inches of sediment control stone in an area that will drain away from the work area. Plan ahead for acceptable methods of removal and disposal of silt bag.

Maintenance

- Inspect inlet pipe and bag for damage and blockage.
- Replace bag when ¾ full of sediment.

Typical Problems

- Discharge too large for pump.
- Pump is too large.
- Continued use when bag is full.
- Inlet pipe disconnected from bag.

5.5 TEMPORARY STREAM CROSSINGS

Temporary stream crossings provide a means for construction equipment to cross streams. The goal is to keep sediment generated by construction traffic out of the water body and minimize the impacts to the stream channel's bottom and banks. Without a stabilized crossing, the constant disturbance of the channel's bottom and banks by construction traffic will result in downstream impacts.

5.5.1 Temporary Fording

5.5.2 Temporary Piped Crossing

5.5.3 Temporary Access Bridge

5.5.1 Temporary Fording

Purpose

The temporary ford uses filter fabric and stone to provide a stable crossing that can be easily removed. These crossings are best suited for streams with a rock channel bottom and having no normal flow. A temporary rock filter should be constructed downstream to capture sediment deposited on the crossing by equipment that may be washed away during storm events.

Figure 40. Temporary Fording (Device should be constructed during no flow conditions)

Conditions Where Practice Applies

- ✓ When performing work and the only equipment access is to cross a stream.
- ✓ Fording should only be used on small streams having intermittent flow. Timing of these impacts should be during no flow periods.
- ✓ Where adequate space is available to accommodate the temporary ford and any construction across the channel.
- ✓ Where banks can be graded back to a slope that will allow equipment access if needed.

Conditions Where Practice Does Not Apply

- ✓ Streams with normal flows.
- ✓ Sites where instream moratorium periods apply.

Construction

Temporary fords should be constructed with Class-A or riprap structural stone over a Type II filter fabric. The crossing must be installed so that erosion during construction and use is minimized.

Step 1 – Locate crossing where approaches and crossing will disturb the least amount of the channel's bank and bottom.

Step 2 – Divert stormwater runoff from the top of the approaches to prevent runoff flowing down the approach and into the stream.

Step 3 – If needed, construct approaches by pulling soil back away from the stream channel. Do not contour the bank by pushing the soil down into the stream.

Step 4 – Center filter fabric on crossing and temporarily anchor ends.

Step 5 – Place stone over fabric on approaches and across stream channel.

Step 6 – Construct temporary rock filter downstream of crossing.

Step 7 - Completely remove all of the ford from stream when construction is complete.

Step 8 – If over-widening of stream channel occurs, structures (i.e. floodplain bench, rock vanes, etc.) will need to be installed to restore natural stream pattern and dimension profile.

Maintenance

- Inspect the ford to ensure that stormwater runoff is diverted away from approach ramps.
- Inspect crossing for erosion and/or damage by construction traffic.
- Inspect temporary rock filter. Remove accumulated sediment and repair any damage.
- Revegetate the stream-side buffers when the crossing approach is complete.

Typical Problems

- Channelization and erosion of approaches from off-site stormwater runoff.
- Over-widening the stream at the crossing location.

5.5.2 Temporary Piped Crossing

Purpose

Provides a means for equipment to cross streams while minimizing the impact of sediment to the stream channel. The temporary crossing uses filter fabric, stone, and piping to provide a stable travel surface that does not restrict normal flow and flow during minor storm events. Ensure stone size is large enough when required to help prevent washouts.

Figure 41. Temporary Piped Crossing

Conditions Where Practice Applies

- ✓ When the existing channel has a normal flow.
- ✓ When performing work and the only equipment access is to cross a stream.

Conditions Where Practice Does Not Apply

- ✓ Sites where instream work moratoriums apply, such as anadromous fish species, etc.

Construction

Step 1 – Locate crossing where approaches and crossing will disturb the least amount of the channel's bank and bottom.

Step 2 – Divert stormwater runoff from the crossing approaches to prevent runoff flowing down the approach and into the stream.

Step 3 – If needed, construct approach ramps by pulling soil back away from the stream channel. Do not contour the bank by pushing soil into the stream. Disturbing stream banks to construct approach ramps should only be undertaken where stone for the crossing cannot effectively be raised to the level of the top of bank.

Step 4 – Center filter fabric on the crossing and temporarily

anchor ends.

Step 5 – Place washed stone over filter fabric across stream channel.

Step 6 – Install temporary pipes on bed of washed stone and cover with stone to a depth sufficient to support equipment loads. Soil should not be used as backfill material.

Step 7 – Armor sides and top of fill to prevent erosion and provide a firm travel surface.

Step 8 – If approach ramps have been excavated, armor side slopes with riprap to prevent erosion when water flows over crossing.

Step 9 – Completely remove crossing immediately upon completion of construction. Establish permanent vegetation on graded areas outside of stream channel.

Maintenance

- Inspect crossing daily and after each rainfall event for damage.
- Inspect runoff diversions along approaches.
- Keep pipes clear of debris.
- Need to revegetate the stream-side buffers when the crossing approach is complete.

Typical Problems

- Runoff channelizes and erodes approaches to the stream crossing.
- Damage to crossing from high flow events.
- Erosion of side slopes where approach ramps are used.
- Flooding upstream due to crossing not being properly designed to handle large flows because over-topping of crossing not allowed or pipes are too small.